

# High dosage essay

[Science](#), [Biology](#)



A starting population of stem cells that proliferates for many months in the laboratory can yield millions of cells. Also, under experimental conditions, stem cells can be induced to become tissue or organ specific cells with specialized functions. Stem cells can give rise to specialized cells. When unspecified stem cells give rise to specialized cells, the process is called differentiation.

While differentiating, the cell usually goes through several stages, becoming more specialized at each step. “ In some organs, such as the gut and bone marrow, stem cells regularly divide to repair and place worn out or damaged tissues. In other organs, however, such as the pancreas and the heart, stem cells only divide under special conditions,” (National Institute of Health, April 2002). There are two common forms of stem cells from animals and humans. These are known as the embryonic stem cells and the adult stem cells.

Stem cells differ according to their source and their malleability. Within the human body, adult stem cells continue to replenish cells that need replacement from normal wear and tear. Muscles, skin, nerves, and the liver are just a few examples of tissues and organs where stem cells can be found. Adult stem cells can be found in specific tissues in the body and include neural stem cells, skin stem cells, and blood (homeopathic) stem cells. Homeopathic stem cells can be found in adult bone marrow and blood and umbilical cord blood. These stem cells are regularly used in standard therapies, as they make new blood cells,” (Lori Knowles, 2009).

A small number of homeopathic stem cells can also be found in the bloodstream. These are called peripheral blood stem cells (BPCS). Other

sources of stem cells include fetal stem cells that are derived from discarded fetal tissue. Also, human embryonic stem cells that are derived from 5 day-old blastocysts – precursors to embryos. “ A blastocyst is a sphere of cells with an inner cell mass of about 30-34 undifferentiated cells that have the potential to form all the tissues in the human” (Lori Knowles, 2009). Stem cell research has been and is still being carried out in order to discover ways in which they can be applied to cure and treat multiple diseases. Through scientific research, stem cells have been shown and applied in the treatment of leukemia through stem cell transplants.

A stem cell transplant infuses healthy blood-forming stem cells into the body. It can be used to restore lethal bone marrow in patients with leukemia as well as help stimulate new bone marrow growth and restore the immune system. These stem cells are most commonly collected from the bone marrow, circulating blood or even umbilical cord blood. There are two main types of stem cell transplants including the autologous stem cell transplant which involved collection of stem cells from the patient themselves, then harvested, frozen and stored until necessary for the patient to receive the stem cells back into their bodies after high dosage of chemotherapy or radiation to destroy the cancer cells within the body.

The diagram below shows how Stem cells are taken from the bone marrow, multiplied and then transplanted into the patient after chemotherapy. The second form of cell transplant is the allogeneic stem cell transplant. “ In this type of transplant, stem cells are taken from a matching donor. Donors may include a relative/family member (e. G.

, sibling), unrelated individual, or saved umbilical cord blood. To determine if a donor's stem cells are the right match, the patient undergoes a human leukocyte antigens (HLA) test" (Cancer Centre). Before a stem cell transplant for leukemia, a person undergoes a conditioning, which involves intensive treatment to destroy as many leukemia cells as possible. This occurs through the receiving of high doses of chemotherapy or radiation therapy. Once this preparative regimen is complete, the patient is ready to undergo the transplant. Much like a blood transfusion, the patient receives the stem cells intravenously. The procedure takes about an hour.

After entering the bloodstream, the stem cells travel to the bone marrow and start to make new blood cells in a process known as engraftment. Research and application of stem cells for therapeutic use has been limited and questioned due to ethical concerns about where the stem cells came from. Until recently, scientists only knew of two ways to obtain stem cells; from embryos and from adults. It is embryonic stem cells that cause controversy. Removing the stem cells requires the destruction of the embryo, which some people liken to destruction of a human being. The issue comes down to the question of when life begins.

Those who believe that life starts at the moment of conception think that harvesting embryonic stem cells can be similar to murder. Some critics of this viewpoint have argued that these embryos were marked for destruction and then donated by their owners, meaning that these embryos would never have come to term anyway, but others predict that this excuse might lead to more ethically questionable actions in the future, such as harvesting

embryos specifically for research” (Edmonds, 2010). In recent years, researchers have tried to find ways to obtain embryonic stem cells without destroying the embryos. One method of deriving stem cells from mice embryos has proven successful. Researchers are also experimenting with reprogramming adult stem cells to act more like embryonic stem cells. These cells, known as induced pluripotent stem cells, hold promise, but scientists would still like the opportunity to pursue work with the embryonic stem cells, regardless of the ethical implications.

Conclusively, despite the biomedical research advances of the last 50 years, there is still a lot left to be discovered in human biology and as a result, millions of people still suffer from devastating diseases. Early human stem cell research is viewed by many as a key to understanding many of the most fundamental questions in basic and clinical biology that can lead to treatments and cures, and ultimately save lives. For this reason, it is important to continue the exploration of stem cells and delve into different ideas and possibilities of the use of these cells to solve and treat many of the biological problems and diseases that our world faces today, without disregard to the implications that this may have either economically, socially or ethically.